

***State of Forest Genetic Resources
in Ethiopia***

Prepared for

**The sub- regional workshop FAO/IPGRI/ICRAF on the conservation,
management, sustainable utilization and enhancement of forest genetic
resources in Sahelian and North-Sudanian Africa
(Ouagadougou, Burkina Faso, 22-24 September 1998)**

By

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A co-publication of FAO, IPGRI/SAFORGEN, DFSC and ICRAF

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The current publication « *State of the Forest Genetic Resources in Ethiopia* » is issue of country national report presented at *The Sub- Regional Workshop FAO/IPGRI/ICRAF on the conservation, management, sustainable utilization and enhancement of forest genetic resources in Sahelian and North-Sudanian Africa* (Ouagadougou, Burkina Faso, 22-24 September 1998). It is published with the collaboration of FAO, IPGRI/SAFORGEN, DFSC and ICRAF, as one of the country and regional series which deals with the assessment of genetic resources of tree species in the Sahelian and North-Sudanian Africa and identification of priority actions for their Conservation and Sustainable Utilization.

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Quantitative information regarding the status of forest and tree resources, including genetic resources, has been compiled according to sources, methodologies and protocols identified and selected by the author. Data comparison between countries using different recording methodologies and sources may not be possible. For standardized methodologies and data on forest resources, please refer to *FAO, 2001. State of the World's Forests 2001*; and to *State of Forest Genetic Resources in Sahelian and North-Sudanian Africa & Regional Action Plan for their Conservation and Sustainable Use*. Working papers FGR/2E, FAO, IPGRI & ICRAF. FAO, Rome, 2001. Official information can also be found at the FAO Internet site (<http://www.fao.org/forestry/Forestry.asp>).

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1. SOCIO-ECONOMIC AND ECOLOGICAL CHARACTERISTICS

1.1. Geographic position of the country

Ethiopia has an area of approximately 1.12 million km² and is located between 3°24' and 14°53' north and 32°42' and 48°12' east (Balcha, 1999). Its population is about 60.1 million in 1997 with 83.7% of rural population (FAO, 1999).

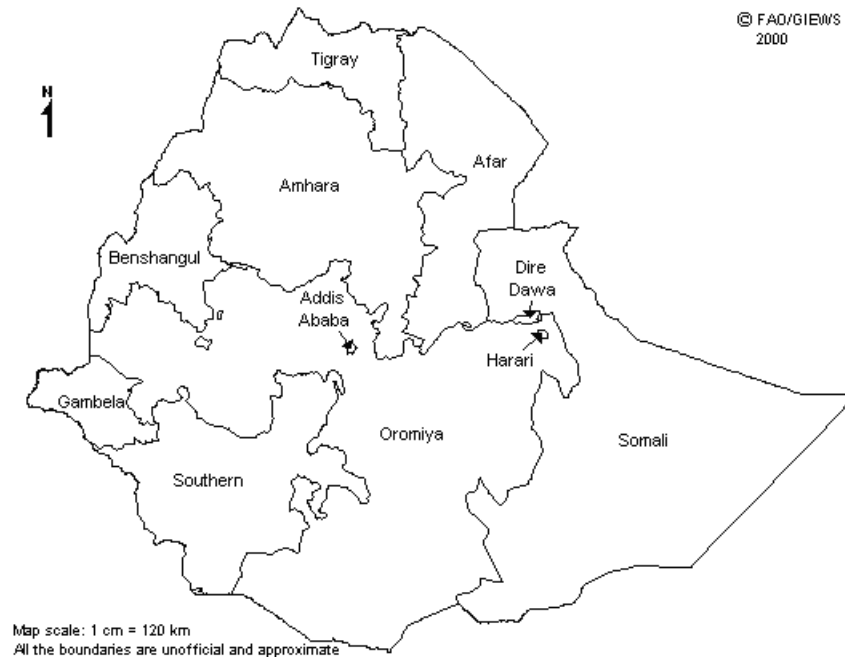


Fig.1: Ethiopia administrative map

1.2. Socio-economic information

Population density is 60.1 inhabitants/km² with an annual rate of change (1995-2000) of 3.2% (FAO, 1999). The GNP per caput was 100 US\$ in 1995 (FAO, 1999). Agricultural sector contributes to 50% of the Gross Domestic Product (FAO/PAM, 1997).

1.3. Ecological information

Four major bio-climatic zones can be identified in the country:

- Dry lowland and plateau, 350-700 mm mean annual rainfall (Zone I)
- Semi-dry lowland and plateau, 700-1050 mm mean annual rainfall (Zone II)
- Semi-wet plateau and lowland 1050-1400 mm mean annual rainfall (Zone III)
- All-year rainfall (wet) region, 1400-2500 mm mean annual rainfall (Zone IV)

The rainfall map of the country is shown at fig.2.

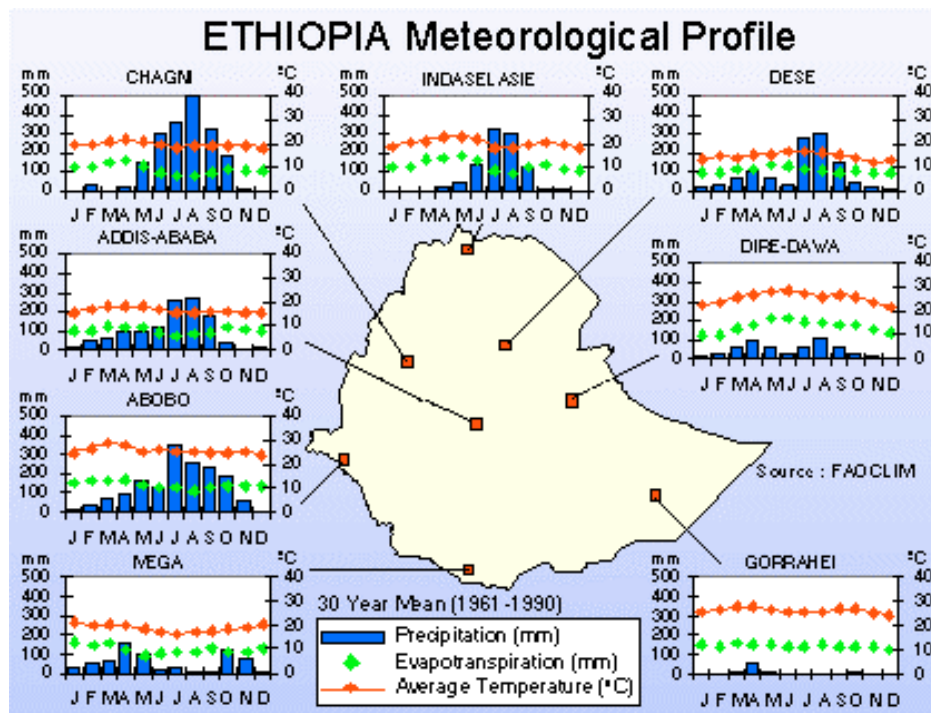


Fig.2: Ethiopia meteorological map

Ethiopia's forest and woody vegetation are classified as:

- Natural high forests
- Woodlands
- Bushlands
- Plantations (including industrial plantations, peri-urban plantations,
- Community plantations and catchment/protection plantations), and
- Trees on farms (farm forestry).

2. STATE OF FOREST GENETIC RESOURCES

2.1. Phytogeography of the country

Owing to the extreme variations in climate, terrain, etc. and comprising most ecological systems, Ethiopia possesses one of the largest and most diverse plant genetic and wildlife resources in the world. The size of the Ethiopian flora is estimated to range from 6500 to 7000 species of higher plants -flowering plants, conifers and ferns of which 12% is considered endemic. The country has also over 300 tree species of which a few are used for construction and industrial purpose.

Historical sources indicate that, on the basis of potential climatic climax, high forests might once have covered some 35% of Ethiopia's land area. If the savanna woodland is included, two-thirds of the country was probably forest or woodland.

The results of 1992 estimates of the forest resources are presented in Table 1.

Table 1. Estimate of the area of forest resources

Forest resources	Area in million (ha)	Percentage (%)
Natural high forest	2.3	8.36
- Slightly disturbed	0.7	
- Heavily disturbed	1.6	
Woodland	5.0	18.20
Bush land	20.0	72.72
Plantations	0.2	0.73
Farm forestry	-	0
Total	27.5	100%

2.2. Utilization patterns of forest species

The major forest products that can be derived from trees and forests include industrial wood, construction wood (pales and posts), charcoal and fuelwood. The minor forest products cover a wide range of products such as honey and wax from beekeeping, gums and incense, resins, and spices.

Industrial wood

The principal types of primary industrial wood products are sawnwood, wood-based panels (including plywood, fiberboard, and particle board) and paper.

In Ethiopia industrial wood production (and consumption) per capita is one of the lowest in the world. The low level of consumption of sawnwood and other industrial wood products reflects the fact that the country's limited forest resources base has been and continues to be primarily exploited for fuelwood.

Construction wood

State enterprises, small urban and rural enterprises and households use construction wood, including poles, posts and lumber. The wood comes from different forest resources, ranging from trees grown on farm and plantations to natural high forests and woodlands; some of it is harvested "illegally".

2.3. Threats

Especially during the last century, Ethiopia's forests and woodlands declined both in size and quality. By the early 1950's, high forests areas were reduced to 16% of the total land area. It has been estimated that by the early 1980's that the land area covered by forest has declined to 3.6%, and by 1989 to about 2.7%.

Although there was no record of the loss of forest genetic resource in the past, and there is very little knowledge of genetic variations between and within species, to date it is likely that some species could have been extinct.

Savannah woodlands occur mainly in the pastoral and agro-pastoral zones. These lands are an important source of fuelwood and construction material for the local communities

Agriculture and livestock (grazing) impact on forest lands

The woody biomass of the woodlands and bushland is being rapidly depleted by the spread of sedentary farming, the growth of pastoralist populations and attendant increases in livestock, and urban demand for fuelwood and charcoal.

Forest exploitation for industrial wood

It is estimated that the current demand for industrial wood is at 400,000 m³ per annum, of which sawnwood accounts for 85 %. At the same time, the annual incremental yield from industrial plantations available as saw logs is estimated to be between 150,000 to 200,000 m³. The volume harvested and, thus actual consumption lies probably above 200,000 m³, but below 400,000 m³ annually. Consumption in excess of 200,000 m³ would result in over-cutting. Indeed, some of the commercially important species are over-exploited to the extent of being endangered. The demand for industrial wood is projected to reach over 1.6 million m³ by the year 2014.

Forest exploitation for construction wood

Based on assessed requirements for different construction purposes, the annual demand for construction wood is estimated to be 2.1 million m³. Demand is projected to increase with population growth and therefore, doubles to 4.3 million m³ by year 2014. The proportion of the current annual incremental yield from all forestry resources available for construction wood is estimated to be in the order of 1.2 million m³. Current consumption is expected to be somewhere between 1.2 and 2.1 million m³ annually. To the extent that consumption exceeds 1.2 million m³, it results in over-cutting of existing plantations, natural forests and woodlands, and or reduced supplies of other wood products.

Fuelwood and the Demand for Energy

Fuelwood is the most important forest product in Ethiopia. For example, annual demand for fuelwood (45 million m³) is close to twenty times the demand for other forest products combined. In addition, woody biomass is the country's single largest source of energy supply. The current annual incremental yield of woody biomass resources is estimated to be 14.4 million m³. If harvesting were limited to this volume (sustainable supply) and managed according to prudent practice, some 1.2 million m³ would be used for construction wood, about 0.2 million m³ for industrial wood, and 0.6 million m³ for fodder. This would leave about 12.5 millions m³ for fuelwood. The estimated demand for fuelwood of 45 million m³ is almost three and a half times greater than sustainable supply, demonstrating the imbalance between the energy required and the capacity of the forest resources to produce.

3. MANAGEMENT OF FGR

3.1. *In situ* conservation activities

Protected areas

Most of the vegetation conservation work in Ethiopia has been associated with protected areas consisting of protected forests, national parks, wildlife reserves and sanctuaries, and controlled hunting areas.

Out of the 10 national parks, which are given total protection, only two - Awash and Semien Mountains - are legally gazetted. Although there are 11 wildlife reserves with a total area of about 29824 square km, about 22829 km² are actively managed as wildlife conservation areas. This accounts for only 1.9% of the total land area. The protected areas also include controlled hunting areas, which are partially protected with local, sustainable extractive use practices.

In an effort to cope with the rapid depletion of forests in recent years, the Government has classified 58 of the most important high forest areas totaling an estimated 2.8 million ha as National Forest Priority Areas (NFPA). Each area may include high forest, plantations and non-forested land. Among the 58 NFPAs, 37 have been identified as protected forests. These proposed protected forest areas are scattered across the regions in the country. In addition to these, the Federal and the Regional states have undertaken several conservation related development programs.

Management plans for NFPAs have been under preparation since 1985. Four such plans have been completed; more than half of the 58 identified NFPAs have been delineated on maps. Demarcation of boundaries has been partly done on some of the NFPAs. However, the NFPAs have not been gazetted, and this has contributed to the uncontrolled, illegal cutting, the encroachment and clearing of forestland for crop production and grazing.

The challenge is to be able to conserve the remaining forest genetic resources, which have been eroded due to deforestation and changes in land use, over grazing, inappropriate harvesting practices and climate change.

3.2. *Ex situ* conservation activities

Seed banks

The National Tree Seed Project main activities have been seed procurement, tree improvement and seed source development.

For the project period, the supply of seed for afforestation and farm forestry has reached 35,000 kg. These have been distributed to governmental, non- governmental organizations and individuals. Until recently, 310 seed source areas have been identified and over 250 hectares of seed production areas have been established for *Pinus patula*, *Cupressus lusitanica*, *Eucalyptus camaldulensis*, *E. globulus*, *E. grandis*, *E. uiminalis* and *Gravillea robusta*. Tree seed zones have also been identified and mapped.

Forest plantation

Industrial plantations for production of saw logs, or transmission and telecommunication poles total an estimated 95,000 ha, most of which is within NFPAs. Peri-urban plantations totalling approximately 35,000 ha are owned and managed by the Government.

It is estimated that community woodlots and catchments protection forests currently total more than 20,000 ha and 70,000 ha respectively.

Botanical and home gardens

In Ethiopia there is no botanic garden, which is an essential facility for the purpose of both research and *ex situ* conservation. Although some introductions of exotic forest trees began as

early as 1897 with the introduction of a few eucalyptus species, large-scale introduction began as late as early 1950s.

3.3. Selection and genetic improvement

Based on a recent review of Forestry Research Centre (FRC), experimental sites comprise a total of 134 trials with 166 different species from 60 genera. The research work has been concentrated on three main fields:

- Species elimination trials, species provenance trials and growth trials for different multi-purpose tree species have been established
- Agroforestry trials
- Work related to seed collection, testing, storage and distribution.

The experimental sites (field trials) are distributed on 34 locations and four major bioclimatic zones. Some of the trial sites are established with appropriate designs allowing statistical analysis of the data. Thus, of the 134 trials, 68 are ongoing, 22 generate valuable data for statistical analysis and the remaining are observation trials.

3.4. National priority species

Of the 300 tree species (over) recorded in the country, only a few are used for construction and industrial purpose. Some of the commercially important species are over exploited to the extent of being endangered. The commercially important indigenous species include:

Albizzia gummifera
Albizzia schimperiana
Aninegria adolfi-fliedericii
Apodytes dimidiata
Blighia unijudata
Bosqueia phoberos
Celtis krayssiana (=africana)
Chlorophora excelsa
Cordia africana
Croton macrostachys
Diospyros abyssinica
Ekebergia rueppelliana (=capensis)
Hagenia abyssinica
Juniperus procera
Mamilkara butugi
Ocotea kenyaensis
Olea hochstetteri
Olea welwitschii
Podocarpus gracilior
Polyscias ferruginea
Pygeum africanum
Syzygium guineense
Warburgia ugandensis

4. POLICY, PLANNING AND INSTITUTIONAL MECHANISM

4.1. National forest policy

Past efforts toward the conservation, utilization and management of forest genetic resources reveal the absence of forest policies and strategies are one of the major constraints that need to be tackled. Both Forestry and Wildlife Policies remain in the draft stage and have yet to be accepted by the government. There is lack of legal status and gazettement of the protected forest areas and human encroachment into protected area

4.2. Laws and others rules

The main laws and rules upon which the forest genetic resources (FGR) conservation and utilization are based are listed as follow: Convention on biological diversity, Convention on CITES, National forest policy, National Forestry Law (Act), National Environment Law (act).

4.3. Institutions involved in forest genetic resources management activities

Until recently forest genetic resource conservation related development activities have been organized under different ministries. As a result, the limited conservation related activities in the country were without definite policy, linkage and coordination. The broader responsibility of private, community and state forest protection and exploitation, the establishment and protection of national parks, forest and wildlife conservation and development and forestry training, research and utilization was given to the Ministry of Natural Resources and Environmental Protection and then to Ministry of Agriculture.

Currently the Natural Resources Management and Regulatory Department of the Ministry of Agriculture is responsible for the formulation of forest policy and strategies and for the conservation, development and utilization of forest resources. On the other hand, the Ethiopian Wildlife Conservation Organization (EWCO) jointly with Regional Agricultural Bureaux is responsible for 10 wildlife reserves, 4 sanctuaries and 18 controlled hunting areas.

Linkages among institutions dealing with forest genetic resource conservation related activities are non-existent.

The absence of comprehensive policy guidelines on the importation, exportation and exchange activities has resulted in the movement and over exploitation of the forest resources in uncoordinated and unregulated manner.

Responsibility for the conservation, management and utilization of forest genetic resources lies with a number of different organization within the government. The activities are not integrated and coordinated which result to the over exploitation of the forest resources. There is also a conflict between the conservation and development objectives of the different institutions of the government. Among the government organizations, which in one way or another have a responsibility to conserve, develop and utilize forest genetic resources include the Environmental Protection Authority, the Ministry of Agriculture, the Ethiopian Agricultural Research Organization and the Regional Bureaux of Agriculture.

5. TRAINING AND RESEARCH CAPACITY BUILDING AND REINFORCEMENT

Available information on the forest resources of Ethiopia is very limited. There is inadequate information on location, extent and volume of the standing growth stock, annual growth rate, or rates at which these resources are being depleted.

The Forestry Research Centre (FRC) under Ministry of Agriculture (MoA) was established in 1975 to carry out research on nursery techniques, species establishment and provenance trials, to undertake seed collection and distribution, trials on seed physiology and agroforestry. In addition to the Forestry Research Centre, other training and development institutions undertake conservation related forestry activities. These institutions carry out some observations on nursery techniques and most of them maintain seed stands and arboreta. They include:

- The Wondo-Genet Forestry College
- The Alemaya University of Agriculture
- The Awassa College of Agriculture
- The Arsi Rural Development Unit.

The Department of Biology of Addis Abeba University (MU) has a project on the propagation of economically important indigenous forest tree species. The project aims at developing methods of rapid propagation through tissue culture and other techniques.

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